controlling a light detection extent in the surface of the object to be measured by changing a size of said opening of said slit to be within a range of approximately 0.2 mm to approximately 30 mm and by changing a magnification of said objective lens.

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 4, 5, and 7-12 remain pending in this application, claims 3, 6, and 13-16 having been canceled, without prejudice or disclaimer, and claims 1, 5, 9, 11, and 12 having been amended by the present amendment.

In the outstanding Office Action, claims 1 and 3-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Shiraishi*.

Claims 1, 5, 9, 11, and 12 have been amended for clarity. More particularly, independent apparatus claims 1 and 9 have been amended to incorporate the subject matter of canceled claim 3 (i.e., the size of the opening of the slit is changeable) and to incorporate new subject matter regarding the range of approximately 0.2 mm to approximately 30 mm within which the size of the opening may be changed (support for new subject matter on page 10, lines 13-19, and more particularly, line 15). Independent method claims 5, 11, and 12 have been amended to incorporate the subject matter of canceled claim 6 (i.e., the step of controlling a light detection extend in the surface of the object to be measured by changing a size of the opening of the slit and by changing a magnification of the objective lens) and to incorporate new subject matter regarding the range of approximately 0.2 mm to approximately 30 mm within which the size of the opening may be changed (support for new subject matter on page 10, lines 13-19, and more particularly, line 15).

Shiraishi discloses illuminating light at a pupil plane of an illumination optical system for illuminating a position detection mark on a substrate. The illuminating light is limited to an

annular area centered at an optical axis, and a member substantially blocks an image-forming light beam distributed over an area on a pupil plane of an image-forming optical system for forming an image of the position detection mark on an imaging device by receiving light generated from the mark. The area is in image-forming relation to the annular area on the pupil plane of the illumination optical system. Alternatively, a member gives a phase difference of approximately $\pi/2$ (rad) between the image-forming light beam distributed over the area which is in image-forming relation to the annular area on the pupil plane of the illumination optical system and the image-forming light beam distributed over the area other than that area.

Shiraishi fails to teach or suggest, as is now recited in independent apparatus claims 1 and 9, that the size of the opening of the slit is changeable from within a range of approximately 0.2 mm to approximately 30 mm. *Shiraishi* also fails to teach or suggest, as is now recited in independent method claims 5, 11, and 12, the step of controlling a light detection extend in the surface of the object to be measured by changing a size of the opening of the slit to within a range of approximately 0.2 mm to approximately 30 mm and by changing a magnification of the objective lens.

More particularly, the present invention relates to a surface inspection apparatus and method which enables the measurement of surface conditions of automobile parts, OA apparatus, household electric appliances, or similar. In the fields of trim parts of automobiles, OA, domestic electrification, and in particular, in products made of synthetic resins, the physical properties of the surfaces of products concerning their external appearances, in concrete terms, injuries, unevenness in height, unevenness in gloss, unevenness in color, the external appearance of a weld line, the external appearance of flow marks, stress whitening, and so forth, have a great deal to do with determining their commodities value.

The surface condition of such a product is hitherto appraised by performing a sensation test, in which a classification is made on the basis of eye observation. In the sensation test, however, minute information about the surface condition, i.e., information at the same level as a

state of seeing with the naked eye, cannot be preserved. A method and an apparatus in which the surface condition of a product or a material can be accurately evaluated or measured has earnestly been desired.

The present invention has enabled superior detection results correlated with eye observation results.

On the other hand, *Shiraishi* relates to a position detecting apparatus which is capable of accurately and reliably detecting the position of a position detection mark on a wafer surface, even a mark having an extremely small height difference (i.e., step) between recessed and projecting portions which contribute to the mark.

Specifically, *Shiraishi's* apparatus deals with the position detection mark which is not able to be detected with the eye observation, while the apparatus of the present invention deals with the injuries, unevenness in height, unevenness in gloss, unevenness in color, and similar, which are observed upon observation by one's eyes.

With regard to the present invention's recitation of a slit, the Office Action indicates that *Shiraishi's* slit is adjustable and points to col. 19, lines 38-41.

Applicants respectfully submit that the function of *Shiraishi's* slit is not described and neither in the extent or range of the size of the changeability of the slit precisely defined.

In the present invention, because the light detection extent in the surface of the object to be measured can be voluntarily controlled according to the surface condition of the object to be measured or similar by controlling the size of the opening of the slit to within a range of approximately 0.2 mm to approximately 30 mm, a more highly accurate inspection can be realized.

Because the reflected light, within the extent limited by narrowing the light detection extent with the slit to be kept within a range of sizes between approximately 0.2 mm and 30 mm, can be taken out and its light quantity can be obtained, the surface condition of the aimed external appearance can be measured exactly and with a high accuracy.

Further, when the surface condition of the object to be measured of a complicated shape is measured, in case of using the objective lens of a low magnification for preventing a divergence of the focus, because the detection extent in the surface of the object to be measured can be restricted by keeping the slit within the range of approximately 0.2 mm to approximately 30 mm, since the surface of the object to be measured can be finely divided into a plurality of light detection extents and detected, the surface condition of the object to be measured can be measured with a good accuracy.

Because a superior detection accuracy can be obtained in this manner, not only the conventional degree of whitening of an injury but also a difference in the surface condition due to color, unevenness in height, or similar, can be measured, and because the whole of the surface of the object to be measured, including an uninjured portion, can be measured, an evaluation result corresponding to the external appearance of the object to be measured can be obtained.

Thus, the object of the present invention and the field wherein the present invention is used, are quite different from that of *Shiraishi* and *Shiraishi* does not render obvious the claims of this application.

Applicants respectfully submit that the amendments to claims 1, 5, 9, 11, and 12 do not add any new matter. Applicants also respectfully submit that claim 4 is directly dependent upon amended claim 1 so that arguments serving to patentably distinguish amended claim 1 from the prior art of record are available, among others, to patentably distinguish claim 4. Applicants also respectfully submit that claims 7 and 8 are either directly or indirectly dependent upon amended claim 5 so that arguments serving to patentably distinguish amended claim 5 from the prior art of record are available, among others, to patentably distinguish claims 7 and 8. Applicants also respectfully submit that claim 10 is directly dependent upon amended claim 9 so that arguments serving to patentably distinguish amended claim 9 from the prior art of record are available, among others, to patentably distinguish claim 10. Based on the foregoing, Applicants request

withdrawal of the rejection of claims 1 and 3-16 under 35 U.S.C. § 103(a) as not being unpatentable over Shiraishi, and allowance of claims 1, 4, 5, and 7-12.

In view of the present amendment, claims 1, 4, 5, and 7-12 are believed to be in condition for allowance, and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Gay Ann Spahn

Gregory J. Maier
Registration No. 25,599
Attorney of Record
Gay Ann Spahn
Registration No. 34,978

22850
Tel: (703) 413-3000
Fax: (703) 413-2220
Email: gspahn@oblon.com

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IN THE CLAIMS:

Please cancel claims 3, 6, and 13-16, without prejudice or disclaimer, and amend claim 1, 5, 9, 11, and 12, as follows:

1. (Twice Amended) A surface inspection apparatus comprising:

a light source for applying a light to a surface of an object to be measured;

an objective lens opposite to the surface of the object to be measured and for receiving a reflected light applied from said light source and reflected on the surface of the object to be measured;

light detection means for detecting a component incident on said objective lens from a parallel direction with an optical axis thereof in said reflected light received by said objective lens and obtaining a light quantity thereof;

a slit provided in an optical path between said objective lens and said light detection means, wherein a size of an opening of said slit is changeable from within a range of approximately 0.2 mm to approximately 30 mm; and

illumination switchover means provided in a light path between said light source and the object to be measured, wherein said illumination switchover means is structurally configured to switch over bright-field illumination, using a half-mirror portion, in which said light from said light source is made parallel with said optical axis of said objective lens and applied to the object to be measured through said objective lens, and dark-field illumination,

in which said light from said light source is made ringlike and applied obliquely with respect to said optical axis of said objective lens such that there is a focus on the surface of the object to be measured.

2. (Canceled).

3. (Canceled).

5. (Twice Amended) A surface inspection method comprising the steps of:

irradiating a surface of an object to be measured with an irradiation light , said irradiation light being reflected from a light source onto the surface of the object to be measured to form a reflected light;

making a component of said reflected light, parallel with an optical axis of an objective lens provided oppositely to the object to be measured, incident on a slit through said objective lens to form an incident light;

switching over an illumination switchover means provided in a light path between said light source and the object to be measured, wherein said illumination switchover means is structurally configured to be switched over between a bright-field illumination, using a half-mirror portion, in which said light from said light source is made parallel with said optical axis of said objective lens and applied to the object to be measured through said objective lens, and a dark-field illumination, in which said light from said light source is made ringlike and applied obliquely with respect to said optical axis of said objective lens such that there is a focus on the surface of the object to be measured;

receiving only a component of said incident light having passed through an opening of said slit to form a received light;[and]

obtaining a light quantity of said received light; and

controlling a light detection extent in the surface of the object to be measured by changing a size of said opening of said slit to be within a range of between approximately 0.2 mm to approximately 30 mm and by changing a magnification of said objective lens.

6. (Canceled).

9. (Twice Amended) A surface inspection apparatus comprising:

a light source for applying a light to a surface of an object to be measured;

a tubular member opposite to the surface of the object to be measured and for receiving said light applied from said light source and reflected on the surface of the object to be measured to become a reflected light;

light detection means for detecting a component incident on said tubular member from a specified direction in said reflected light and obtaining a light quantity thereof;

a slit provided in an optical path between said tubular member and said light detection means, wherein a size of an opening of said slit is changeable from within a range of approximately 0.2 mm to approximately 30 mm; and

illumination switchover means provided in a light path between said light source and the object to be measured, wherein said illumination switchover means is structurally configured to switch over bright-field illumination, using a half-mirror portion, in which said light from said light source is made parallel with said optical axis of said objective lens and applied to the object to be measured through said objective lens, and dark-field illumination, in which said light from said light source is made ringlike and applied obliquely with respect to said optical axis of said objective lens such that there is a focus on the surface of the object to be measured.

11. (Twice Amended) A surface inspection method comprising the steps of:

irradiating a surface of an object to be measured with a light to form an irradiation light;

reflecting said irradiation light on the surface of the object to be measured to form a reflected light;

making only a component in almost one direction incident on a slit through a tubular member in the reflected light to form an incident light;

switching over an illumination switchover means provided in a light path between said light source and the object to be measured, wherein said illumination switchover means is structurally configured to be switched over between a bright-field illumination, using a half-mirror portion, in which said light from said light source is made parallel with said optical axis of said objective lens and applied to the object to be measured through said objective lens, and a dark-field illumination, in which said light from said light source is made ringlike and applied obliquely with respect to said optical axis of said objective lens such that there is a focus on the surface of the object to be measured;[and]

obtaining only a component of a light quantity through an opening of said slit in said incident light; and

controlling a light detection extent in the surface of the object to be measured by changing a size of said opening of said slit to be within a range of approximately 0.2 mm to approximately 30 mm and by changing a magnification of said objective lens.

12. (Twice Amended) A surface inspection method comprising the steps of:

irradiating a surface of an object to be measured with a light to form an irradiation light;

reflecting said irradiation light on the surface of the object to be measured to form a reflected light;

making said reflected light incident on a slit through an optical fiber cable to form an incident light;

switching over an illumination switchover means provided in a light path between said light source and the object to be measured, wherein said illumination switchover means is structurally configured to be switched over between a bright-field illumination, using a half-mirror portion, in which said light from said light source is made parallel with said optical axis of said objective lens and applied to the object to be measured through said objective lens, and a dark-field illumination, in which said light from said light source is made ringlike and applied obliquely with respect to said optical axis of said objective lens such that there is a focus on the surface of the object to be measured;[and]

obtaining a light quantity of only a component having passed through an opening of said slit in said incident light; and

controlling a light detection extent in the surface of the object to be measured by changing a size of said opening of said slit to be within a range of approximately 0.2 mm to approximately 30 mm and by changing a magnification of said objective lens.

13. (Canceled).

14. (Canceled).

15. (Canceled).

16. (Canceled).